

# Assessment of Various Parameters, Management and Complications of Acute Pancreatitis Patients

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## ABSTRACT

**Introduction:** Acute pancreatitis can be a diagnostic challenge given the non-specific nature of the symptoms and widely varying results of investigations. Thus, the present study was conducted to evaluate role of different prognostic factors on the basis of laboratory and radiological investigations in predicting the clinical outcome of the disease, either favourable or unfavourable in patients with acute pancreatitis.

**Material and Methods:** The present retrospective study was commenced over randomly selected thirty patients, diagnosed with first episode of acute pancreatitis in a tertiary care hospital. Required data were recorded in the proforma and these parameters were then used individually or in a defined scoring system to confirm the diagnosis and to assess the progression of the disease in terms of favourable or unfavourable outcome. They were correlated with the severity of the disease confirmed over the course of the disease by application of the standard Atlanta classification system.

**Results:** Patients with CRP $\geq$ 15 mg/dl (80%, n=16) were associated with significant disease severity that only 3 (18%) patients had mild disease. Among patients who had undergone CECT scan (70%, n=21), patients having CTSI $\geq$ 5 (57% n=12) were associated with moderate to severe disease (83%, n=10). They had much higher incidence of unfavourable outcome (58% n=7) and numbers of local complications. Patients (40%, n=12) with Japanese severity criteria clinical score  $\geq$ 3 and/or CT grade  $\geq$ 2 were significantly associated with moderate to severe disease severity (100%, n=12) and unfavourable disease outcome (75%, n=9) and thus mortality (33%, n=4).

**Conclusion:** After the study of new Japanese severity scoring system for acute pancreatitis, it is found that the scoring system is effective in predicting the disease course and outcome. Among available blood investigations hemoconcentration (PCV $>$ 48%) is associated with unfavourable outcome. CRP level  $\geq$ 15 mg/dl significantly reflects the disease severity and unfavourable outcome. Balthazar CTSI  $\geq$ 5 and diagnosis of necrosis involving more than 30% of pancreatic parenchyma is associated with poor prognosis and development of adverse outcome. All these individual parameters are associated with poor prognosis and warn clinician regarding possible adverse outcome of the disease.

**Keywords:** Acute pancreatitis; Hemoconcentration; Investigations.

investigations. The diagnosis typically involves a combination of history and examination, abnormal laboratory investigations and radiological evidence of pancreatic inflammation.<sup>2</sup> Thus, the present study was conducted to evaluate role of different prognostic factors on the basis of laboratory and radiological investigations in predicting the clinical outcome of the disease, either favourable or unfavourable in patients with acute pancreatitis.

## MATERIAL AND METHODS

The present retrospective study was commenced over randomly selected thirty patients diagnosed with first episode of acute pancreatitis in a tertiary care hospital. Patients diagnosed with chronic pancreatitis were excluded.

Patient clinically seeming to be affected with acute pancreatitis having specific complaints of pain in upper abdomen with or without radiation to back, nausea, vomiting, abdominal distension etc. with characteristic history of alcoholism, family history etc. have been admitted to surgery ward. Diagnosis of acute pancreatitis was confirmed with the specific clinical and laboratory measures. Required data were recorded in the proforma and these parameters were then used individually or in a defined scoring system to confirm the diagnosis and to assess the progression of the disease in terms of favourable or unfavourable outcome. They were correlated with the severity of the disease confirmed over the course of the disease by application of the standard Atlanta classification system.

In this study, favourable outcome is ascribed to survivors without ICU admission or need of surgery and unfavourable outcome is ascribed to nonsurvivors, patient undergoing surgery for local complications and ICU admission.

Selected laboratory investigations such as hematocrit value, total leukocyte count, serum calcium level, C reactive protein level were correlated with the disease severity and outcome of the disease. Balthazar CT severity index  $\geq$ 5 and identification of cases with necrosis involving more than 30% of the pancreas on CECT scan; were correlated with the severity of the disease and favourable and unfavourable outcome. New Japanese Criteria System as per standard protocol was used to assess the prognosis and correlated with the disease severity and favourable and unfavourable outcome. All the criteria were correlated with the

## INTRODUCTION

Acute pancreatitis (AP) is a potentially life threatening disease with varying severity of presentation. The revised Atlanta classification system has classified AP into mild, moderate, and severe. More than 80% of acute pancreatitis attacks are mild and self-limiting and resolve without serious complications. In 20% of cases, however, it can be severe and complicated by major morbidity or mortality.<sup>1</sup>

Acute pancreatitis can be a diagnostic challenge given the non-specific nature of the symptoms and widely varying results of

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mean hospital stay. Favourable outcome is ascribed to survivors without ICU admission or need of surgery and unfavourable outcome is ascribed to no survivors, patient undergoing surgery and ICU admission.

**RESULTS**

Sex distribution was almost equal in number with male comprising 53% (n=16) and females 47% (n=14). Although from the pediatric age to geriatric age any patients can present, the mean age of presentation was 41 years.

In this study out of thirty patients 7 patients had hemoconcentration with hematocrit value >48%. Three patients had less than 30% hematocrit and 20 patients had normal hematocrit value. On

laboratory investigation, leucocytosis (total leukocyte count > 11000/mm<sup>3</sup>) was present in 17 (57%) patients. With only two previously known case of diabetes, out of thirty patients total 7 (23%) had random blood sugar level >200 mg/dl, 6 (20%) had random blood sugar level between 140-200 mg/dl while others had random blood sugar level less than 140mg/dl. Out of the known diabetic patient one had random blood sugar level more than >200mg/dl and one had <140mg/dl. Out of 30 patients, total 20 (67%) patients underwent CRP level assessment. Out of them 16 (80%) patient had level ≥15mg/dl and 4 (20%) had level <15mg/dl. Table-1 show laboratory parameters.

Of the total thirty patients; 8 (27%) had serum creatinine level more than 1.2 mg/dl. Rest had normal serum creatinine level. Out of total 30 patients only two patients had serum amylase and lipase level within normal limit; out of them one had infected necrotic pancreatitis and one had oedematous pancreatitis both of them died. Serum calcium measurement was done in 22 (73%) patients, out of which hypocalcemia (S.Ca<sup>++</sup> <8.2mg/dl) was found in 10 (45%) patients and 12 (55%) patients had normal calcium level.

**Imaging study**

**CECT Findings**

Out of 30 patients, 21 (70%) patients had underwent CECT scan during the management course (table-2), of which 11 (52%) had necrotizing and 10 (48%) had edematous pancreatitis. Among necrotizing pancreatitis group 7 (64%) patients had more than 30% of pancreatic parenchyma involved by necrosis. Out of 21 patients score, 9 patients had score less than 5 was while remaining 12 had score equal or more than 5.

**Etiological observation**

After proper clinical and investigative process etiology of the disease process were found. With available history of disease process, consideration of previous history, usage of radiological and laboratory investigative procedures main three etiologies; alcoholism, cholelithiasis and idiopathic were identified in the study cases.

While 7 (23%) patients were found to be chronic alcoholics, 8 (27%) patients had cholelithiasis suggested by radiological finding. One patient who was having gall bladder stone was also a chronic alcoholic and in that case alcoholism was accepted as an etiology to the disease. Rest 15 (50%) patients, the etiology was idiopathic.

**Japanese severity scoring system**

As per Japanese severity criteria for acute pancreatitis, patients were assessed for the same and observation made after giving the clinical score and also CT grade in 21 patients who had undergone CECT scan. This finding suggested that there were 12 (40%) patients who had clinical criteria score ≥3 and/or CT grade ≥2, while remaining 18 (60%) patients had clinical criteria score of <3 and/or CT grade <2.

Laboratory parameters	Number of the Patients
Hematocrit value	
>48%.	7
<30%	3
Normal	20
RBS (Random Blood Sugar) Level	
>200mg/dl	7 (23%)
140-200mg/dl	6 (20%)
<140mg/dl	17 (57%)
CRP Level	
CRP ≥15 mg/dl	16 (80%)
CRP <15 mg/dl	4 (20%)
	Total= 20

**Table-1:** Laboratory parameters

CECT Scan	Number of patients
Oedematous Pancreatitis	10 (48%)
Necrotizing Pancreatitis	11 (52%)
	Total= 21
Balthazar CECT scan severity index	
CTSI	Number of patients
<5	9 (43%)
≥5	12 (57%)
	Total = 21

**Table-2:** Radiological observations

Cause of SICU shift	Number of patients
Respiratory distress	6 (60%)
Respiratory distress and severe hypotension	2 (20%)
Postoperatively (ventilatory and/or inotropic support)	2 (20%)
	Total= 10
<b>Management of patients</b>	
Conservative	27 (90%)
Endoscopy (ERCP)	1 (3%)
Laparotomy and proceed	2 (7%)
	Total= 30 (100%)

**Table-3:** Cause of SICU admission

Severity category	Local complication		Systemic complication
Mild	No(peri) pancreatic complication	and	No organ failure
Moderate	Sterile (peri) pancreatic complication	or	Transient organ failure
Severe	Infectious (peri) pancreatic complication	or	Persistent organ failure
Critical	Infectious (peri) pancreatic complication	and	Persistent organ failure

**Table-4:** Severity category and Complications

**Disease severity classification**

After applying standard Atlanta classification for severity of the disease, in this study 13 (43%) patients had mild disease, 8 (27%) had moderate disease and 8 (27%) had severe disease. One (3%) was having critical disease.

**ICU Admission**

Of the thirty patients, 10 (33%) were shifted to SICU; of them 4 (40%) died, 3 died in the SICU itself, and one died in the ward. Cause of shifting to SICU was respiratory distress in 6 (60%) patients, respiratory distress and severe hypotension in 2 (20%) patients. In 2 (20%) patients it was postoperatively for ventilatory and/or ionotropic support purpose.

**Management**

Out of thirty patients during the course of hospital stay, 27 were managed conservatively and 3 had some intervention. Two had undergone laparotomy and proceed; while one had undergone ERCP and stenting. Total 10 patients were shifted to SICU and remaining managed in ward itself (table-3).

**Complication**

Out of thirty patients, 11 patients did not develop any local complications and 9 patients did not develop any systemic complications. The complications are enlisted below suggestive of ascites as a most common local complication and pleural effusion as a most common systemic complication.

**Duration of the hospital stay**

Out of the thirty patients, 11(37%) patients had hospital stay less than a week. There were 14(47%) patients, who had hospital stay between 8-14 days. One (3%) patient had hospital stay between 15-20 days. Four (13%) patients had hospital stay more than 21 days.

Patients with CRP $\geq$ 15 mg/dl (80%, n=16) were associated with

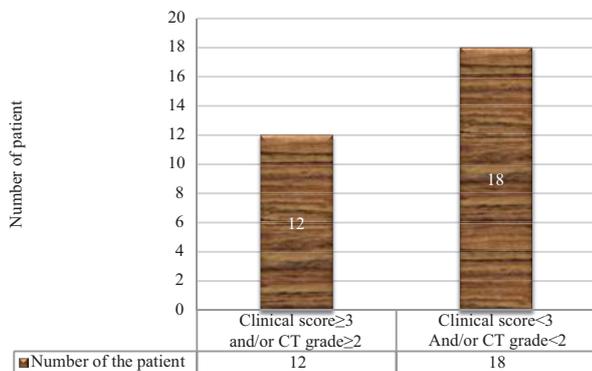
mean duration of hospital stay of 13.28 days. Among patients who had undergone CECT scan, patients with necrosis $>$ 30% were associated with significantly lengthy duration of stay (15.14 days).

After application of standard criteria included in new Japanese severity scoring system for acute pancreatitis, it was clearly evident that patients (40%, n=12) with Japanese criteria clinical score  $\geq$ 3 and/or CT grade  $\geq$ 2 were significantly associated with moderate to severe disease severity and these patients had lengthier mean duration of hospital stay (12 days).

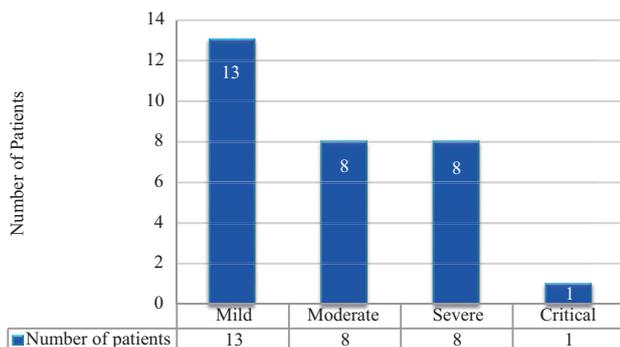
There were 4 patients who died, of which 2 died within 24 hours of admission. One died postoperatively while the other died after conservative treatment within 15 days of admission. Others were discharged from the ward. In our study 20 (67%) patients had favourable and 10 (33%) had unfavourable outcome.

**DISCUSSION**

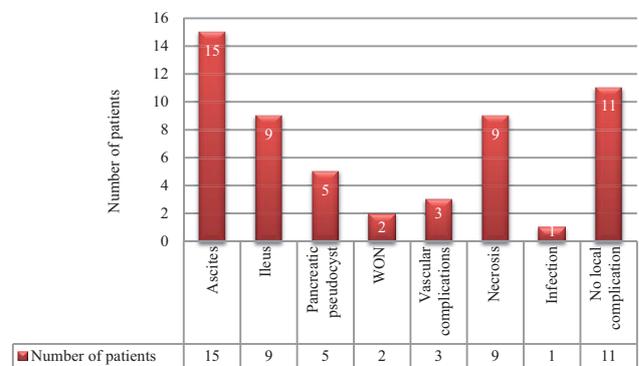
Studies have shown that hemoconcentration predicts parenchymal necrosis as well as the presence of organ failure and



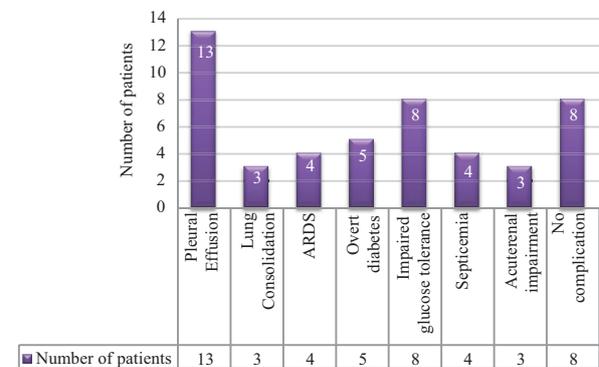
**Graph-1:** Japanese severity criteria



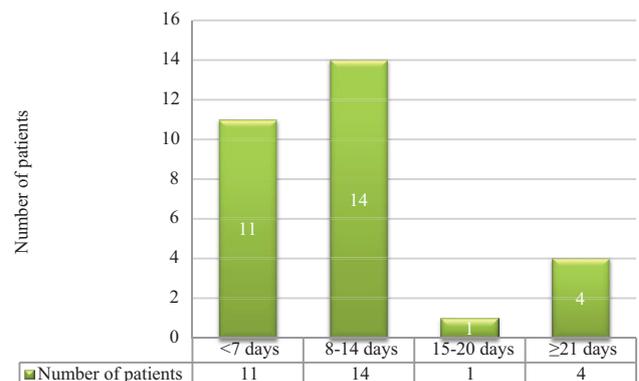
**Graph-2:** Atlanta severity classification



**Graph-3:** Local complications



**Graph-4:** Systemic complications



**Graph-5:** Duration of the hospital stay

thus suggesting severity of acute pancreatitis.<sup>3,4</sup> Hypocalcemia with values less than 8.2 mg/dl is also pathologically associated with “soap formation” in areas of fat necrosis and is thus important predictor of severity. MODS can be predicted with reasonably high accuracy at the time of hospital admission using a combination of anti inflammatory cytokine IL-10 and serum calcium.<sup>5-7</sup>

The Santorini consensus conference (1999), the World Congress of Gastroenterology guidelines (2002) and the United Kingdom guidelines (2005) recommended CRP level of more than 15 mg/dl detected 48 hrs after the onset of diseases as a reliable parameter suggesting worsening of disease.<sup>8-10</sup>

Serum LDH >500 U/dl is also an indicator of poor prognosis.<sup>9,11</sup> Hypoproteinemia with serum albumin <3.0 gm/dl is very poor prognostic factor as it is associated with high mortality rate.<sup>7</sup> The present study reported that among normal hematocrit patients, 11 had mild disease, 7 had moderate disease and 3 had severe disease. Out of 7 patients who had hemoconcentration, 5 (71%) had unfavourable outcome. But it has not significantly altered the disease course as it shows the magnitude of dehydration which could be overcome with adequate fluid therapy. Serum calcium measurement was done in 22 patients out of which hypocalcemia (S.Ca<sup>++</sup> <8.2mg/dl) was found in 10 patients, of which 3 (30%) had mild disease and 7 (70%) had moderate degree of disease. Among patients with hypocalcemia 3 (30%) had unfavourable outcome. Out of 10 patients having unfavourable outcome 7 had leucocytosis while 1 had leucopenia.

The inflammatory mediators IL-8 and IL-6 have shown promise as early indicators of severe disease but, await general availability and further clinical validation.<sup>5</sup> Other inflammatory markers including TNF soluble receptors, PMN elastase, serum procalcitonin, soluble IL-2 receptors and soluble e-selectin have shown potential investigative approach but awaits reproducible essays to be used as prognostic indicators.<sup>5</sup> TAP (Trypsinogen Activation Peptide) released with the activation of trypsinogen to trypsin, levels of which in urine and plasma are known to correlate with the severity of pancreatitis.<sup>12</sup>

The recent data implies D-dimer as a highly sensitive and specific marker for future organ dysfunction and its use as an important prognostic indicator in severe acute pancreatitis.<sup>5,13</sup>

This various parameters and factors are available to quantify severity of acute pancreatitis but validation, reproducibility and then acceptance are still debatable to be used as a prognostic marker for severe acute pancreatitis.

Close monitoring of cardiovascular, respiratory, renal system is necessary to detect earliest the possible outcome and shift of patient to high dependency unit for further management.<sup>9</sup>

The Santorini consensus conference (1999) determined obesity (BMI>30 kg/m<sup>2</sup>), collection of pleural effusion, APACHE 2 score ≥6, CRP more than 15 mg/dl as the severity criteria and recommended this as the transfer criteria. The practice guidelines (2006) in acute pancreatitis consider organ dysfunction as the most important reason for transfer and stated that assessment of the patients with decreased blood pressure and renal failure who show no response to hypoxia in particular should be transferred to ICU immediately and advised the aggressive fluid replacement.<sup>9</sup> In the present study, out of total 10 patients having unfavourable outcome, 8 (80%) had CRP≥15mg/dl, in the remaining two, CRP level assessment was not done.

According to guide lines by British society of Gastroenterology (1998) pancreatic necrosis of more than 50% or acute exudates collection in multiple sites by CECT or complication of organ dysfunction necessitates shifting of the patient to SICU.<sup>50,69</sup> In the present study total 21(70%) cases had undergone CECT scan. Among eight severe cases, 7 (88%) cases; out of 8 moderate cases 7(88%) cases, 1 (100%) critical case and out of 13 mild cases 6 (46%) had undergone CECT scan. Among them 11 (53%) had necrotizing and 10 (47%) had edematous pancreatitis.

With advent of CT scan, Contrast Enhanced CT scan has become invaluable in determining disease severity in acute pancreatitis. It gives an objective assessment of the disease state and need of intervention. Various CT grading i.e Balthazar, Japanese ministry of health and family welfare CT grading etc are in use.<sup>14,15</sup>

It is based on the degree of pancreatic swelling, the amount of fluid in the peripancreatic tissue and the degree of non perfusion of the pancreas.<sup>15</sup> In the present study, among 7 severe cases, who had undergone CECT scan 5 (72%) had Balthazar score more or equal to 5. Among moderate cases, who had undergone CECT scan 4 (72%) had CTSI ≥5. Among 12 patients with CTSI ≥5, 7 (58%) had unfavourable outcome. The 3 (75%) died patients also had CTSI ≥5. Out of 10 SICU shifted patient 7 (70%) had CTSI ≥5. As per Japanese severity criteria for acute pancreatitis, those patients who had clinical criteria score ≥3 and/or CT grade ≥2 were total 12 in number; no one had mild disease and out of them 8 (67%) had severe, 1 (8%) had critical and 3 (25%) had moderate severity disease. Out of these 12 patients, 10 (84%) were conservatively managed, two (16%) were operated upon. Total 9 patients (75%) had to be shifted to SICU and 3 (25%) were managed in ward by oxygen support conservatively. Out of the 9 patients shifted to SICU, 2 (22%) were operated case. So every patient needed some sort of respiratory intervention. Out of them 4 (34%) died. Patients with score of clinical criteria of <3 and/or CT grade <2 were remaining 18; out of them 13 (72%) had mild and 5 (28%) had moderate disease. Of them only one who had moderate disease was managed in SICU.

A third patient with acute pancreatitis develops complications and a quarter of these will die of them, these complications may be either local or regional or systemic.<sup>16</sup>

Most of these complications occur in conjunction with severe acute pancreatitis and they provide basis for defining four categories of severity.<sup>17</sup>

Atlanta symposium, 1992 defined local complication of severe acute pancreatitis in terms of pancreatic necrosis, pseudocyst and abscess. The revised Atlanta classification, also recommended few introduction in the locoregional complications after better understanding of etio-pathogenesis of acute pancreatitis.<sup>7,18,19</sup>

Although ascites was more common local complication in the present study, its relation with severity and adverse outcome could not be made. Among local complication Walled Off Necrosis (WON) and infective complications and vascular complications were significantly associated with disease severity (100%) and unfavourable outcome (100%). Pleural effusion was most common systemic complication and its aggravated pathological complications, lung consolidation and ARDS were significantly associated with disease severity and unfavourable outcome and thus mortality. After the study of new Japanese

severity scoring system for acute pancreatitis, it is found that the scoring systems is effective and accurate in predict the disease course and outcome. Urgent intervention and close monitoring in the patient found to be having severe disease based on this scoring systems, can change the disease course well before in time, morbidity and mortality thus can be limited.

## CONCLUSION

After application of standard criteria included in new Japanese severity scoring system for acute pancreatitis, it was clearly evident that patients (40%, n=12) with Japanese criteria clinical score  $\geq 3$  and/or CT grade  $\geq 2$  were significantly associated with moderate to severe disease severity (100%, n=12) and unfavourable disease outcome (75%, n=9) and thus mortality (33%, n=4) also. All these patients (100%, n=12) needed some sort of respiratory management in form of oxygen support, CPAP or ventilatory support. These patients had lengthier mean duration of hospital stay (12 days). Among available blood investigation hemoconcentration (PCV>48%) is associated with unfavourable outcome. CRP level  $\geq 15$  mg/dl significantly reflects the disease severity and unfavourable outcome. Balthazar CTSI  $\geq 5$  and diagnosis of necrosis involving more than 30% of pancreatic parenchyma is associated with poor prognosis and development of adverse outcome. All these individual parameters are associated with poor prognosis and warn clinician regarding possible adverse outcome of the disease.

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